Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

General Certificate of Secondary Education
Foundation Tier and Higher Tier
March 2010

Science A
Unit Biology B1b (Evolution and Environment)

Biology
Unit Biology B1b (Evolution and Environment)

BLY1BP

F&H

Wednesday 3 March 2010 Morning Session

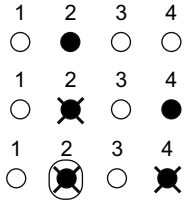
For this paper you must have:
- a black ball-point pen
- an objective test answer sheet.

You may use a calculator.

Time allowed
- 30 minutes

Instructions
- Fill in the boxes at the top of this page.
- Check that your name, candidate number and centre number are printed on the separate answer sheet.
- Check that the separate answer sheet has the title 'Biology Unit 1b' printed on it.
- Attempt **one Tier only**, **either** the Foundation Tier **or** the Higher Tier.
- Make sure that you use the correct side of the separate answer sheet; the Foundation Tier is printed on one side and the Higher Tier on the other.
- Answer **all** the questions for the Tier you are attempting.
- Record your answers on the separate answer sheet only.
- Do all rough work in this book, **not** on your answer sheet.

Instructions for recording answers
- Use a **black ball-point pen**.
- For each answer **completely fill in the circle** as shown.
- Do **not** extend beyond the circles.
- If you want to change your answer, **you must** cross out your original answer, as shown.
- If you change your mind about an answer you have crossed out and now want to choose it, draw a ring around the cross as shown.



Information
- The maximum mark for this paper is 36.

Advice
- Do **not** choose more responses than you are asked to. You will lose marks if you do.
- Make sure that you hand in both your answer sheet and this question paper at the end of the test.
- If you start to answer on the wrong side of the answer sheet by mistake, make sure that you cross out **completely** the work that is not to be marked.

You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.
The Higher Tier starts on page 16 of this booklet.

FOUNDATION TIER

SECTION ONE

Questions **ONE** to **FIVE**.

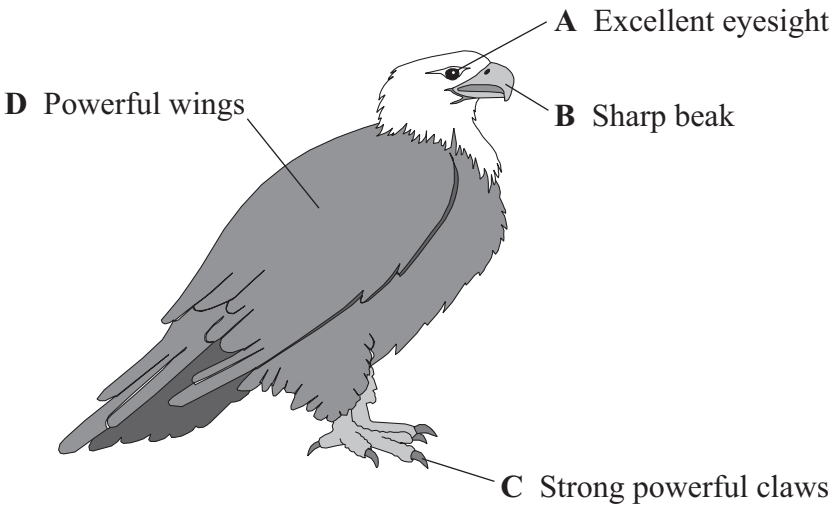
In these questions, match the letters, **A**, **B**, **C** and **D**, with the numbers **1– 4**.

Use **each** answer only **once**.

Mark your choices on the answer sheet.

QUESTION ONE

The eagle is a predator that swoops on other animals on which it feeds.



Match adaptations, **A**, **B**, **C** and **D**, with the functions **1– 4** in the table.

	Function
1	enable the bird to swoop down on prey
2	keep a firm grip on prey to carry it to its nest
3	used to spot prey from a great distance
4	used to peck prey into small pieces

QUESTION TWO

The drawing shows trees being cleared to make more land for farming.

Match words, **A**, **B**, **C** and **D**, with the numbers **1–4** in the sentences.

A biodiversity

B pollution

C global warming

D deforestation

The removal of vast areas of trees is called . . . **1** . . . .

This can reduce . . . **2** . . . .

The trees no longer remove carbon dioxide from the atmosphere. This results in increased . . . **3** . . . .

The lorries used to move the trees cause air . . . **4** . . . .

Turn over for the next question

QUESTION THREE

This question is about reproduction.

Match words, **A**, **B**, **C** and **D**, with the statements **1–4** in the table.

A genes

B gametes

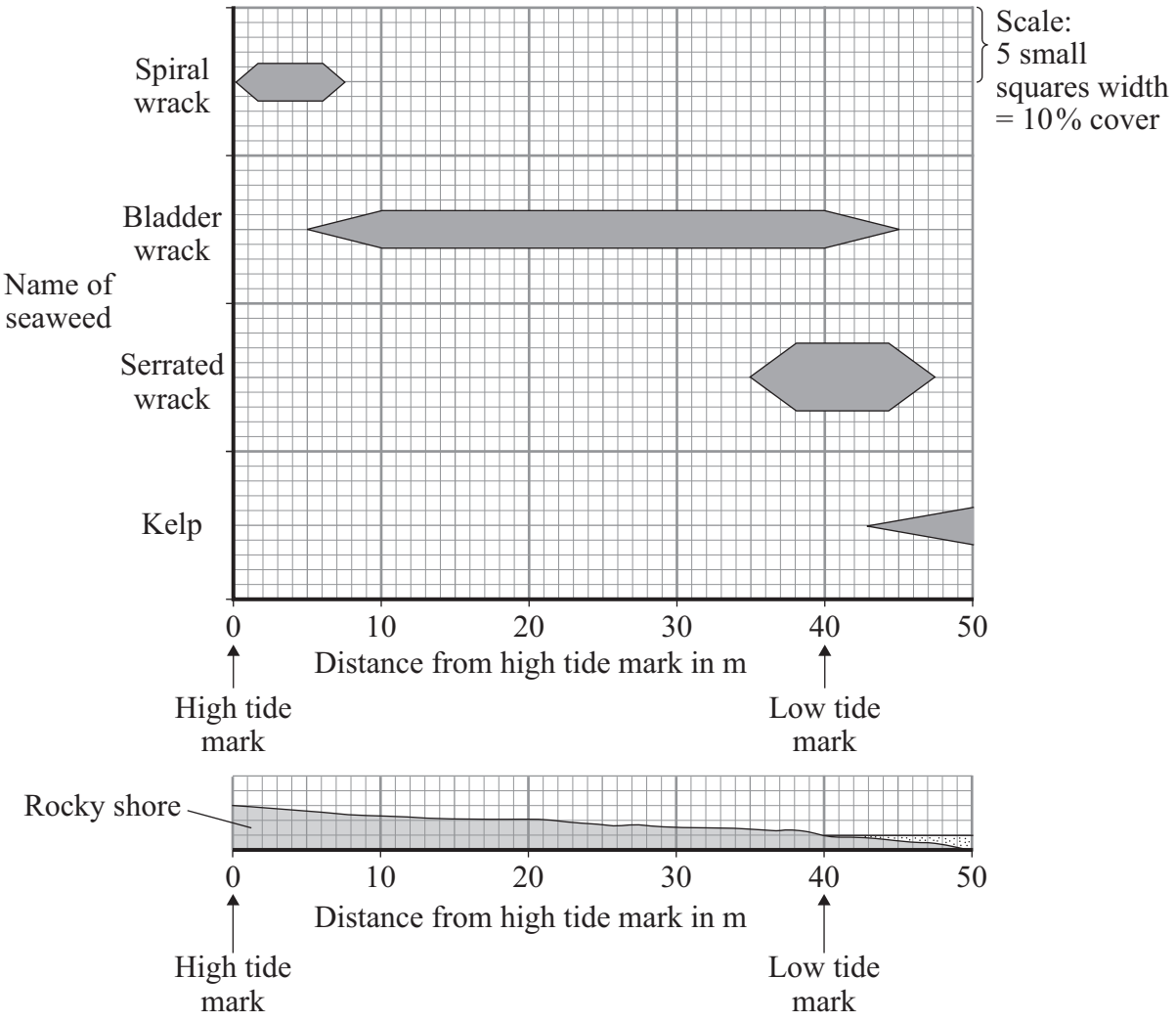
C characteristics

D nucleus

1	cells which fuse to form offspring
2	control the development of features
3	the part of a cell which contains chromosomes
4	features we can see, such as eye colour

QUESTION FOUR

The diagram shows how much of four different seaweeds are found growing on different parts of a rocky shore.



Use the diagram to match the names of seaweeds, **A**, **B**, **C** and **D**, with the statements **1–4** in the table.

A spiral wrack

B bladder wrack

C serrated wrack

D kelp

1	All of this seaweed is always covered by the sea.
2	This seaweed is found across the widest range of distance on the rocky shore.
3	This seaweed can survive the driest conditions.
4	At 45 metres from the high tide mark there is more of this seaweed than any other.

QUESTION FIVE

Tasmanian tigers are similar to Tasmanian devils. Tasmanian tigers became extinct in the 20th century.

The picture shows a Tasmanian tiger.

Scientists are trying to create living Tasmanian tigers. They are using cells from the well-preserved remains of a pregnant Tasmanian tiger. They are trying several methods.

Match methods, **A**, **B**, **C** and **D**, with the descriptions **1–4** in the table.

A sexual reproduction

B tissue culture

C embryo transplants

D adult cell cloning

	Description
1	Splitting cells from the Tasmanian tiger embryo and transplanting them into the womb of a Tasmanian devil.
2	Joining female gametes from the Tasmanian tiger with male sperm cells from a Tasmanian devil.
3	Growing small groups of cells in a special nutrient solution.
4	Transferring the nucleus from a Tasmanian tiger skin cell into a Tasmanian devil egg cell. After the cell is given an electric shock, it is transferred to the womb of a female Tasmanian devil.

Turn over for the next question

SECTION TWO

Questions **SIX** to **NINE**.

Each of these questions has four parts.

In each part choose only **one** answer.

Mark your choices on the answer sheet.

QUESTION SIX

Evolution may result in entirely new species over a period of time.

6A Simple life forms first evolved about . . .

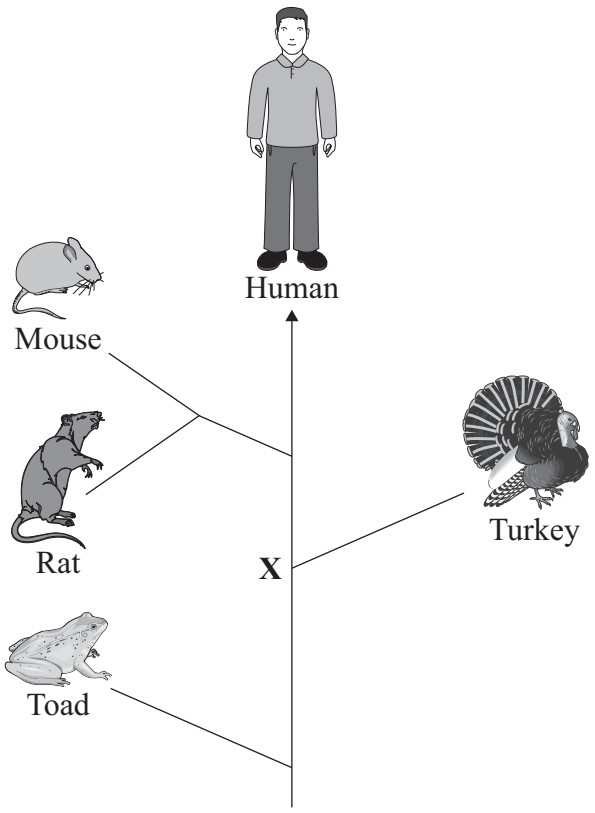
1 3 hundred years ago.

2 3 thousand years ago.

3 3 million years ago.

4 3 billion years ago.

The diagram shows an evolutionary tree.



6B The differences between the rat and the mouse are due to differences in their . . .

1 genes.

2 environment.

3 survival.

4 food.

6C The point labelled **X** represents a common ancestor for . . .

1 turkey, human, mouse and rat.

2 toad, turkey, rat and mouse.

3 toad, human, rat and mouse.

4 turkey, toad, human and rat.

6D The two animals on this diagram that are most closely related are the . . .

1 mouse and rat.

2 turkey and toad.

3 human and mouse.

4 rat and turkey.

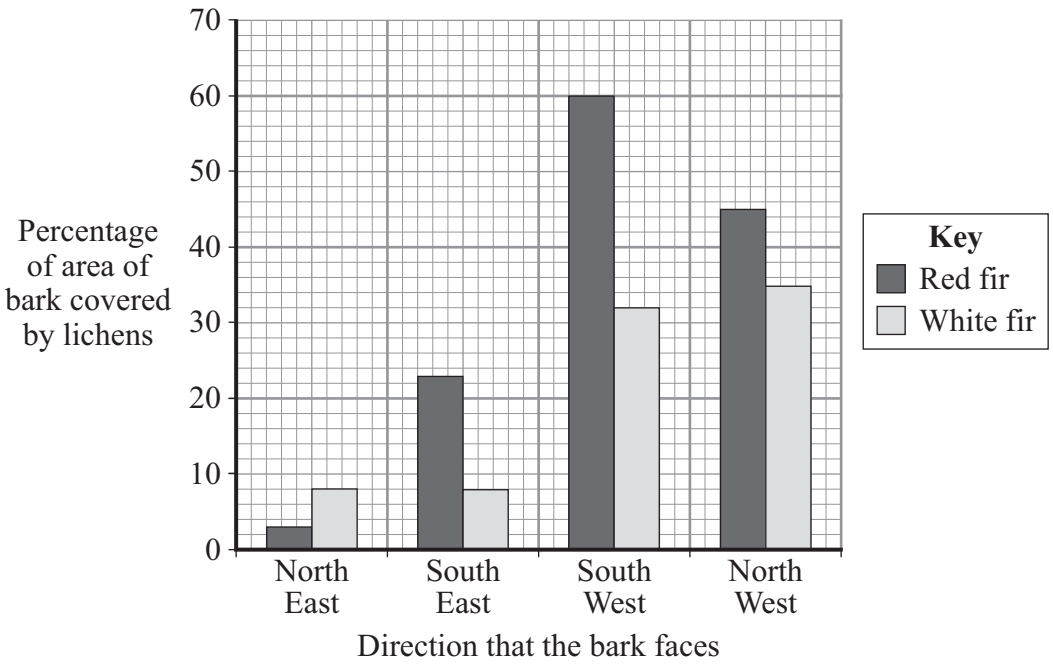
Turn over for the next question

QUESTION SEVEN

Lichens are indicators of sulfur dioxide pollution.

Scientists investigated the area of bark covered by lichens on two species of fir tree in a forest.

The bar chart shows their results.



7A Which piece of apparatus could the scientists use to estimate the area of bark covered by lichen?

1 compass

2 protractor

3 quadrat

4 thermometer

7B The side of the trees with the greatest percentage of the bark covered by lichens faced . . .

1 North East.

2 South East.

3 South West.

4 North West.

7C The wind blows air polluted by sulfur dioxide from factories into the forest.

What is the main direction from which the polluted air blows?

1 North East

2 South East

3 South West

4 North West

7D From the data on the bar chart, which would be the best indicator of sulfur dioxide pollution?

1 lichen on red fir because it is most affected by sulfur dioxide

2 lichen on white fir because it is most affected by sulfur dioxide

3 lichen on red fir because it is least affected by sulfur dioxide

4 lichen on white fir because it is least affected by sulfur dioxide

Turn over for the next question

QUESTION EIGHT

This question is about the way in which new varieties of plants are produced.

8A Genetically identical individuals are known as . . .

1 embryos.

2 gametes.

3 species.

4 clones.

People can now buy a purple variety of cauliflower.

These purple cauliflowers have been produced as a result of careful selection.

8B How can new varieties of plants be produced?

1 tissue culture

2 asexual reproduction

3 sexual reproduction

4 cloning

8C The purple colour of the first purple cauliflower was due to . . .

1 genetic engineering.

2 a mutation.

3 embryo transplantation.

4 gene transfer.

8D At first there was only one purple cauliflower.

How could large numbers of purple cauliflowers be produced from this first one?

1 interbreeding purple and white cauliflowers

2 taking small groups of cells from the purple cauliflower and then growing them

3 genetic modification of white cauliflowers

4 'cutting out' the gene for the purple colour and transferring it into white cauliflowers

Turn over for the next question

QUESTION NINE

Some plants produce poisonous chemicals for protection.

- The Bullshorn acacia does not have poisonous chemicals to defend itself.
- The Bullshorn acacia compete with poisonous acacia plants that grow in the same area.
- The Bullshorn acacia has ants living at the base of its thorns.
- The ants eat a sugary substance from the Bullshorn acacia and also eat insects that feed on the acacia.

9A The most likely reason for the presence of ants on the Bullshorn acacia is that . . .

1 the Bullshorn acacia does not have to produce poisonous substances.

2 the ants are able to find food easily.

3 the Bullshorn acacia can use the extra sugar for growth.

4 the ants reduce competition between acacia plants.

A scientist removed the ants from one plant and left another plant with its ants. He then measured the growth rate of the plants. The results are shown in the table below.

Date plants measured	**Increase in Bullshorn acacia height (cm)**	
	With ants	Without ants
May	0	0
June	29	7
July	91	14

9B What was the hypothesis being tested in this investigation?

1 The presence of ants increases the growth rate of the Bullshorn acacia.

2 The Bullshorn acacia protects ant species.

3 The ants help in the sexual reproduction of the Bullshorn acacia.

4 The Bullshorn acacia uses the carbon dioxide from the ants for photosynthesis.

9C The scientist's data might be unreliable because . . .

1 only two plants were used in the experiment.

2 there is little difference between the growth of the two plants.

3 readings were taken on only three occasions.

4 the actual height of the plants is not recorded.

9D Using all the information in this question, which row in the table suggests the best conditions for the Bullshorn acacia to grow successfully?

	Poisonous acacia	**Ants**
1	not present	not present
2	present	not present
3	not present	present
4	present	present

END OF TEST

You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.
The Foundation Tier is earlier in this booklet.

HIGHER TIER

SECTION ONE

Questions **ONE** and **TWO**.

In these questions, match the letters, **A**, **B**, **C** and **D**, with the numbers **1–4**.

Use **each** answer only **once**.

Mark your choices on the answer sheet.

QUESTION ONE

Tasmanian tigers are similar to Tasmanian devils. Tasmanian tigers became extinct in the 20th century.

The picture shows a Tasmanian tiger.

Scientists are trying to create living Tasmanian tigers. They are using cells from the well-preserved remains of a pregnant Tasmanian tiger. They are trying several methods.

Match methods, **A**, **B**, **C** and **D**, with the descriptions **1–4** in the table.

A sexual reproduction

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C embryo transplants

D adult cell cloning

	Description
1	Splitting cells from the Tasmanian tiger embryo and transplanting them into the womb of a Tasmanian devil.
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Turn over for the next question

QUESTION TWO

Bristlecone pines are some of the oldest known trees.

Match features, **A**, **B**, **C** and **D**, with the statements **1–4** in the table.

A The trees' leaves live for about 30 years.

B The trees can grow new bark.

C The trees have needle-shaped leaves.

D The trees grow far apart.

1	The tree trunks can survive being struck by lightning.
2	There is little competition for minerals between the trees.
3	The trees can survive long periods of drought.
4	The trees need few minerals each year for growth.

Turn over for the next question

SECTION TWO

Questions **THREE** to **NINE**.

Each of these questions has four parts.

In each part choose only **one** answer.

Mark your choices on the answer sheet.

QUESTION THREE

This question is about the way in which new varieties of plants are produced.

3A Genetically identical individuals are known as . . .

1 embryos.

2 gametes.

3 species.

4 clones.

People can now buy a purple variety of cauliflower.

These purple cauliflowers have been produced as a result of careful selection.

3B How can new varieties of plants be produced?

1 tissue culture

2 asexual reproduction

3 sexual reproduction

4 cloning

3C The purple colour of the first purple cauliflower was due to . . .

1 genetic engineering.

2 a mutation.

3 embryo transplantation.

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3D At first there was only one purple cauliflower.

How could large numbers of purple cauliflowers be produced from this first one?

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2 taking small groups of cells from the purple cauliflower and then growing them

3 genetic modification of white cauliflowers

4 'cutting out' the gene for the purple colour and transferring it into white cauliflowers

Turn over for the next question

QUESTION FOUR

Some plants produce poisonous chemicals for protection.

- The Bullshorn acacia does not have poisonous chemicals to defend itself.
- The Bullshorn acacia compete with poisonous acacia plants that grow in the same area.
- The Bullshorn acacia has ants living at the base of its thorns.
- The ants eat a sugary substance from the Bullshorn acacia and also eat insects that feed on the acacia.

4A The most likely reason for the presence of ants on the Bullshorn acacia is that . . .

1 the Bullshorn acacia does not have to produce poisonous substances.

2 the ants are able to find food easily.

3 the Bullshorn acacia can use the extra sugar for growth.

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A scientist removed the ants from one plant and left another plant with its ants. He then measured the growth rate of the plants. The results are shown in the table below.

Date plants measured	**Increase in Bullshorn acacia height (cm)**	
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4B What was the hypothesis being tested in this investigation?

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2 The Bullshorn acacia protects ant species.

3 The ants help in the sexual reproduction of the Bullshorn acacia.

4 The Bullshorn acacia uses the carbon dioxide from the ants for photosynthesis.

4C The scientist's data might be unreliable because . . .

1 only two plants were used in the experiment.

2 there is little difference between the growth of the two plants.

3 readings were taken on only three occasions.

4 the actual height of the plants is not recorded.

4D Using all the information in this question, which row in the table suggests the best conditions for the Bullshorn acacia to grow successfully?

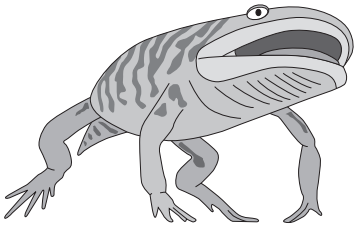
	Poisonous acacia	**Ants**
1	not present	not present
2	present	not present
3	not present	present
4	present	present

Turn over for the next question

QUESTION FIVE

A new fossil find may be an evolutionary missing link in the amphibian family tree.

The drawing shows an artist's impression of a frogamander.



The 290 million year old fossil, nicknamed 'frogamander', was first collected in Texas by a scientist in the mid-1990s. It was rediscovered in a museum in 2004.

'It had a look of both frogs and salamanders', said the scientist who led a new study of the fossil. 'But I also recognised some primitive features, and I thought that this would be a critical piece of evidence in trying to work out the origins of modern amphibians.'

5A The frogamander needed pools of fresh water in order to breed. It is now extinct.

Which is the most likely cause of its extinction?

1 It was a small animal.

2 It could not run very fast.

3 It fed on small insects.

4 The climate became warmer.

5B Frogs and salamanders are different types of living amphibians.

The different characteristics of frogs and salamanders are directly due to . . .

1 new competitors.

2 changes to the diseases that affect them.

3 changes in their genes.

4 new predators.

5C Evolution is brought about by natural selection.

Natural selection always involves the survival of the . . .

1 oldest individuals.

2 most intelligent individuals.

3 individuals most suited to the environment.

4 individuals who can eat the widest range of food.

5D Scientists have not completed the evolutionary tree for amphibians yet because . . .

1 frogamanders have primitive features.

2 no-one has ever seen a frogamander.

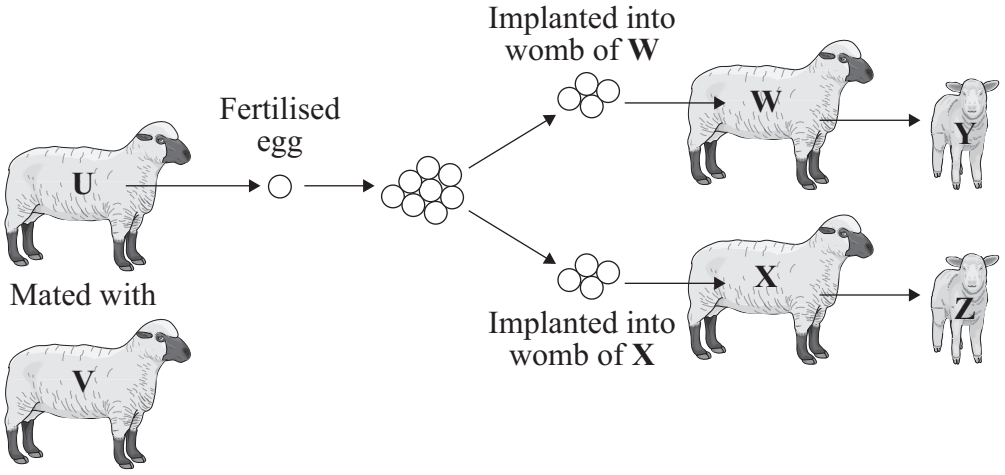
3 there is not enough fossil evidence.

4 scientists do not know the mechanism of inheritance in amphibians.

Turn over for the next question

QUESTION SIX

The diagrams illustrate one method of reproducing sheep.



6A The cells of the embryo which develops from the fertilised egg will contain genetic information . . .

1 from both sheep **U** and sheep **V**.

2 from sheep **U** only.

3 from sheep **V** only.

4 from neither sheep **U** nor sheep **V**.

6B The genetic information in the cells of the embryos that develop in sheep **W** and sheep **X** will be . . .

1 from sheep **U** only.

2 from sheep **V** only.

3 from both sheep **U** and sheep **V** but not identical.

4 identical.

6C For **Y** and **Z**, the only thing we can be certain about is that both will be . . .

1 female.

2 male.

3 the same sex.

4 the same sex as sheep **V**.

6D Which sheep are clones?

1 **U** and **V**

2 **W** and **X**

3 **Y** and **Z**

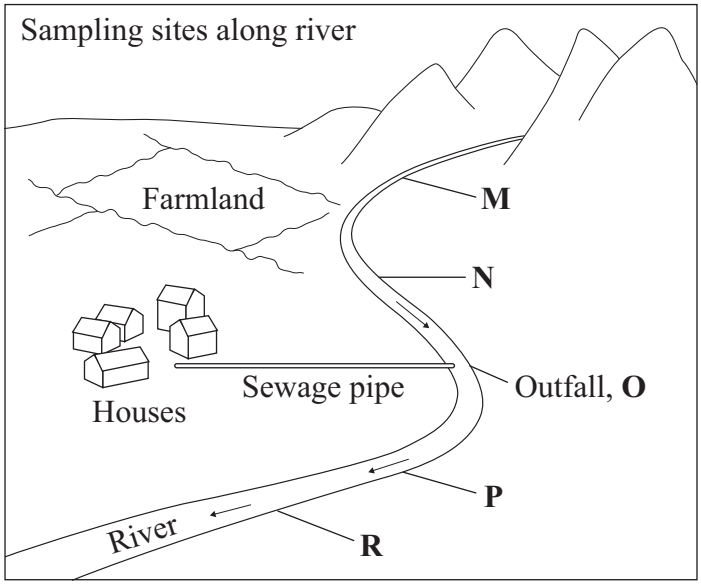
4 **W**, **X**, **Y** and **Z**

Turn over for the next question

QUESTION SEVEN

Oxygen is used in respiration by organisms. The amount of oxygen in a river can give information about the health of a river.

The oxygen content of a river was measured by scientists at a series of locations, **M** to **R**, including where sewage entered the river.



7A The oxygen meter that the scientists used gave values in whole numbers. The readings at each location were all the same.

The most likely explanation for this is that . . .

1 the meter was not reliable.

2 any differences in the oxygen content were less than the sensitivity of the meter.

3 the oxygen content does not matter to the health of the river.

4 there was no difference in the oxygen content of the water at the different locations.

7B A different type of oxygen meter was then used.

The oxygen content of the river just below the sewage outfall was found to be lower than that above the outfall.

The most likely reason for this is that . . .

1 the river was running faster just below the sewage outfall.

2 less oxygen was dissolving from the air just below the sewage outfall.

3 dissolved oxygen was used up for respiration by microorganisms from the sewage.

4 toxic chemicals from the sewage outfall were polluting the river.

There was a change in the species of animal that lived in the river further downstream past the sewage outfall.

The table shows the relative numbers of each type of organism from each sampling point along the river.

	Upstream		Sewage outfall	Downstream	
Sample position along river	**M**	**N**	**O**	**P**	**R**
Stonefly larvae	5	6	0	0	2
Water snail	20	15	10	12	12
Caddisfly larvae	7	8	1	2	6
Bloodworms	4	3	30	25	12

7C Which organism was found in greatest numbers in water with low oxygen levels?

1 stonefly larvae

2 water snails

3 caddisfly larvae

4 bloodworms

7D In the past year, the concentration of oxygen in the river downstream past the sewage outfall has decreased.

This is most likely to have been caused by . . .

1 a decrease in water temperature all along the river.

2 increased use of toxic chemicals in the surrounding farms that drain into the river.

3 an increase in the human population in the area.

4 fewer fish inhabiting the river.

QUESTION EIGHT

The Lua tribe of the Philippines rely on 'slash and burn' agriculture. They cut down and burn an area of forest big enough to grow their crops. After about two years they move on to use another area of the forest. The Lua tribe has survived in the same region for many years. Their agriculture has to be managed very carefully.

8A The population of the tribe increased, so they burned a bigger area of the forest in which they lived.

What would be the most likely effect on the species that normally live in the region?

1 The animals would live at a higher population density in the remaining forest.

2 The animals would move away from the farmed area but die in the remaining forest because there would be too much competition.

3 There would be more types of native species because new areas of forest had been cleared.

4 There would be no effect on the native species.

The agricultural methods used by the Lua tribe had little effect on the carbon dioxide concentration in the air.

8B The most likely reason for this is that . . .

1 their population was not growing fast enough.

2 when the Lua tribe burns the forest, oxygen is taken in and carbon dioxide is released.

3 the Lua tribe did not plant rice on the cleared land.

4 the amount of carbon dioxide released by burning was the same as the amount of carbon dioxide reabsorbed by the crops.

8C A forestry company was given the right to harvest the mature trees in the area, but also burned other areas.

Why was the company accused of increasing the chance of climate change?

1 Cutting down trees causes an increase in the temperature of the atmosphere.

2 Burning trees releases the 'locked up' carbon as carbon dioxide into the atmosphere, which then traps heat.

3 Using the trees for timber releases carbon dioxide into the atmosphere more quickly than photosynthesis can absorb it.

4 Fewer trees in the area allows more space for microorganisms to respire and release carbon dioxide.

8D Deforestation by the forestry company led to a reduction in biodiversity.

Why should society be concerned about this decrease?

1 A greater biodiversity reduces the chance of climate change.

2 The forest food chains would be shorter.

3 Some of the organisms that were lost may have been of future use.

4 There may be an increased use of herbicides in the area.

Turn over for the next question

QUESTION NINE

Read the passage about the introduction of invasive species.

Birds are important members of forest communities.

Guam, a Pacific island, lost most of its native birds after a predator, the brown tree snake, was introduced by accident. The snake population density is now quite high – estimated at more than 4000 per square kilometre.

Before the introduction of the brown tree snake, Guam had 12 species of native forest birds. Today, 10 of those are extinct on Guam, and the other two species each have fewer than 200 individuals.

9A The main reason for the rapid increase in the population of brown snakes on Guam was probably that . . .

1 the climate on Guam suited them.

2 there was an abundant supply of tree seeds for food for the snakes.

3 the bird population on Guam had decreased rapidly.

4 there were no predators of brown snakes on Guam.

9B The bird populations on Guam fell rapidly after the introduction of the brown snake.

One possible reason for this was that . . .

1 the number of trees on Guam declined rapidly.

2 the birds on Guam did not recognise the brown snake as a predator.

3 there was competition between the snake and the birds for food.

4 the number of insects on Guam declined rapidly.

A scientist investigated seed dispersal in forests on Pacific islands. She set seed traps beneath and near trees on Guam and on the nearby island of Saipan. Saipan does not have brown tree snakes.

On Saipan, the scientist found seeds in nearly every trap at each location. But on Guam, the seeds appeared only in traps directly under the trees.

Use all the information in this question to answer the following two questions.

9C The scientist's results suggest that . . .

1 seeds on Guam are mainly dispersed by birds.

2 seeds on Guam are mainly dispersed by wind.

3 the distance that seeds on Guam are dispersed depends mainly on their mass.

4 fewer seeds are produced by the trees on Guam than on Saipan.

9D Overall, the most serious long-term effect of the introduction of brown snakes into Guam is likely to be . . .

1 a reduction in the number of birds.

2 a reduction in the number of trees.

3 a reduction in biodiversity.

4 a reduction in sustainable development.

END OF TEST

There are no questions printed on this page

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Question 2H Jupiter Images